INVENTIONS & INNOVATION

Project Fact Sheet

COAL LOG FUEL PIPELINE TRANSPORTATION SYSTEM

LOG PIPELINE COSTS LESS AND USES LESS ENERGY THAN CONVENTIONAL TRANSPORTATION METHODS

Benefits

- Costs less per ton-mile and uses significantly less energy than other pipeline methods used for transporting coal
- Saves up to 70% of the water used in slurry pipelines while transporting the same amount of material
- Technology equally suitable for agricultural products, solid waste, or biomass
- Reduces pumping energy and abrasion erosion problems
- Improves the reliability of coal transportation
- Reduces the number of coal trucks and trains needed for transportation
- Eliminates coal dust and spontaneous combustion threat during transportation and storage at power plants, leading to cleaner plants
- Eliminates the restart problems that occur in the operation of long-distance slurry pipelines

Applications

The primary application for this technology is to supply coal-fired utility and industrial boilers. Commercial development of coal pipelines will likely lead to the development of pipelines for transporting grain and other agricultural products, as well as solid wastes.

Traditional coal transportation by truck and rail is costly, consumes a great deal of energy, and contributes to environmental and safety problems. A new system of delivering coal and other materials via pipelines will greatly lessen these drawbacks. In instances where coal is transported through long stretches of pipe, it is in a slurry mixture of fine coal particles and water. While large volume slurry pipelines are more cost effective over long distances than conventional transportation methods, the slurry has its own problems, including requiring substantial amounts of water and creating possible environmental hazards.

A new technology created at the Capsule Pipeline Research Center at the University of Missouri uses less energy and costs less than current technology coal slurry pipelines. The new technology compresses coal or other materials, such as agricultural products or biomass, into cylinders (called logs or capsules) 5% to 10% thinner than the transportation pipeline. Water suspends and moves the logs through the pipe. In addition to being more cost effective, the capsule pipeline is also more environmentally sound than conventional transportation since the coal logs eliminate coal dust erosion of the pipe interior and erosion of coal fines by rain at the power plant storage site.

PIPELINE PILOT PLANT

The capsule pipeline generally costs less per ton-mile, uses significantly less energy than conventional transportation methods, and poses no environmental threat.

Project Description

Goal: The project goals were to construct a pilot plant for testing the technology and to ready the technology for commercialization.

The coal log pipeline technology mixes coal that has been mined, cleaned, and crushed, with a binding agent comprised of coal pitch, bitumen, or wax. The coal mixture is then tightly compressed and compacted as coal logs. The logs are injected into a pipeline and pumped along using water. The pipeline can deliver the coal to coal-fired electric power stations or coal storage areas. The coal logs must then be crushed for use in fluidized bed, cyclone, or chain-grate stoker coal-burning boilers or pulverized for use in pulverized-coal combustors.

The pipeline technology also has applications beyond coal transportation. For example, the same technology can be used to compact and transport other minerals or solid wastes (such as iron ore or power plant ashes). Materials that cannot be in direct contact with water can be enclosed in metallic or plastic containers (capsules) that can then be transported via the pipeline using the same pumping means and control system developed for coal.

In addition, the same compaction technology developed for the coal log project can be applied to compacting other materials. Currently, the Capsule Pipeline Research Center is demonstrating the technology to compact biomass for fuel. Use of these biomass logs as fuel reduces not only the greenhouse effect but also the need for disposing of solid wastes in landfills.

The University of Missouri developed this technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies. The Inventions Program seed money resulted in a multimillion-dollar program jointly funded by the National Science Foundation, Federal Energy Technology Center, Missouri Department of Economic Development, and an industry consortium of thirty companies.

Progress and Milestones

- Currently constructing a pilot plant in Missouri for testing purposes.
- Consortium is seeking potential commercial projects within the utility and coal industries.
- Inventors are testing other uses for coal log pipeline technology, such as compacting biomass for use as a substitute fuel at coal-fired power plants.
- Protected by three U.S. patents: 4,946,317; 5,658,357; and 5,879,421.

Economics and Commercial Potential

Transportation costs for coal comprise a major part of its cost per ton. In the Great Lakes region where coal is heavily used, transportation typically accounts for 40% to 50% of the total delivered cost of coal. The higher costs created through coal transportation are passed along to the consumer through higher bills for electricity. A coal log pipeline would lower costs and eliminate the need to import oil to fuel railroads and trucks to ship the coal after mining.

The specific economic and commercial potential for this invention is currently being investigated at the Capsule Pipeline Research Center in Columbia, Missouri. Additionally, this pipeline technology will extend to other industries, including agriculture, increasing the economic potential of this invention.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

For project information, contact:

Dr. Henry Liu
University of Missouri-Columbia
Capsule Pipeline Research Center
E2421 Engineering Building E
Columbia, MO 65211-2200
Phone: (573) 882-2779
Fax: (573) 884-4888
liuh@missouri.edu

Home Page:
www.cclabs.missouri.edu/~cprc

For more information about the Inventions and Innovation Program, contact:

Lisa Barnett
Program Manager
Inventions and Innovation Program
Phone: (202) 586-2212
Fax: (202) 586-7114
lisa.barnett@ee.doe.gov

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Office of Industrial Technologies
Energy Efficiency and
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U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585-0121

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